Norovirus Gastroenteritis:

Management of Outbreaks in Healthcare Settings

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

Norovirus

- The most common cause of cases of acute gastroenteritis and gastroenteritis outbreaks
- Can affect nearly everyone in the population (from children to the elderly and everyone in between!) particularly because there is no long term immunity to the virus
- Causes acute but self-limited diarrhea, often with vomiting, abdominal cramping, fever, and fatigue
  - Most individuals recover from acute symptoms with 2-3 days , but can be more severe in vulnerable populations

Burden of Norovirus Infection

- #1 cause of acute gastroenteritis in U.S.
  - 21 million cases annually
  - 1 in 14 Americans become ill each year
  - 71,000 hospitalized annually in U.S.
  - 80 deaths annually among elderly in U.K.
  - 91,000 emergency room visits overall in the U.S.
- Occurs year round with peak activity during the winter months
- Cases occur in all settings, across the globe

Scallan et al. 2011. EID. 17(1): 7-15.; Patel et al. 2008. EID. 14(8); 1224-31.; Harris et al. 2008. EID. 14(10); 1546-52.

Norovirus in Healthcare Facilities

- Norovirus is a recognized cause of gastroenteritis outbreaks in institutions.
- Healthcare facilities are the most commonly reported settings of norovirus gastroenteritis outbreaks in the US and other industrialized countries.
- Outbreaks of gastroenteritis in healthcare settings pose a risk to patients, healthcare personnel, and to the efficient provision of healthcare services.

Norovirus Activity in Healthcare

- Incidence of norovirus outbreaks in acute care facilities and community hospitals within the United States remains unclear.
- This is in contrast with the established high burden of acute care hospital outbreaks reported in many other industrialized countries.

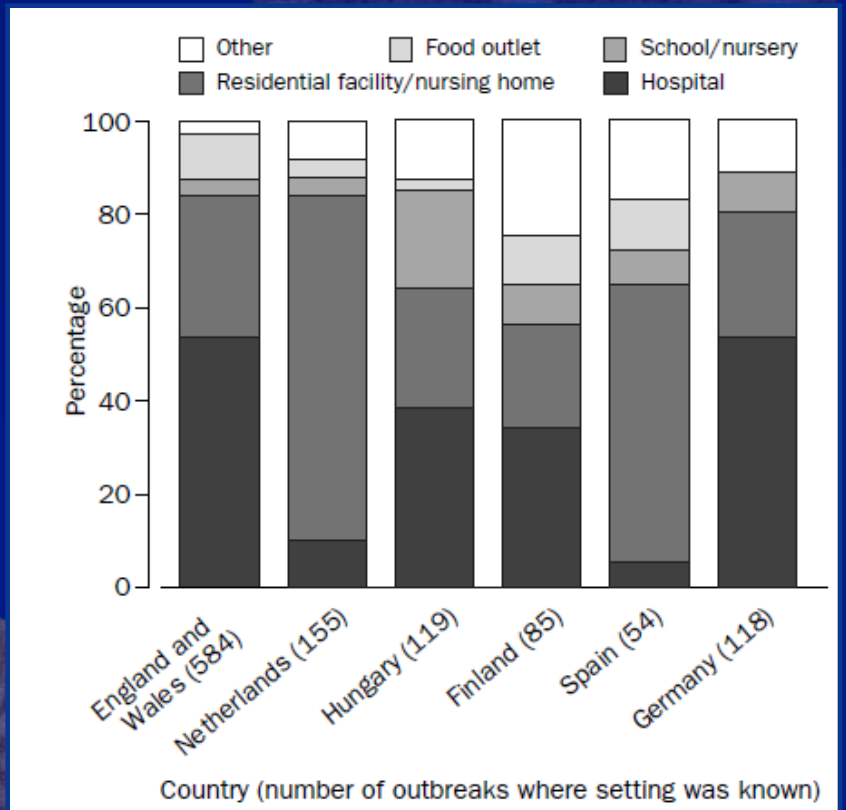
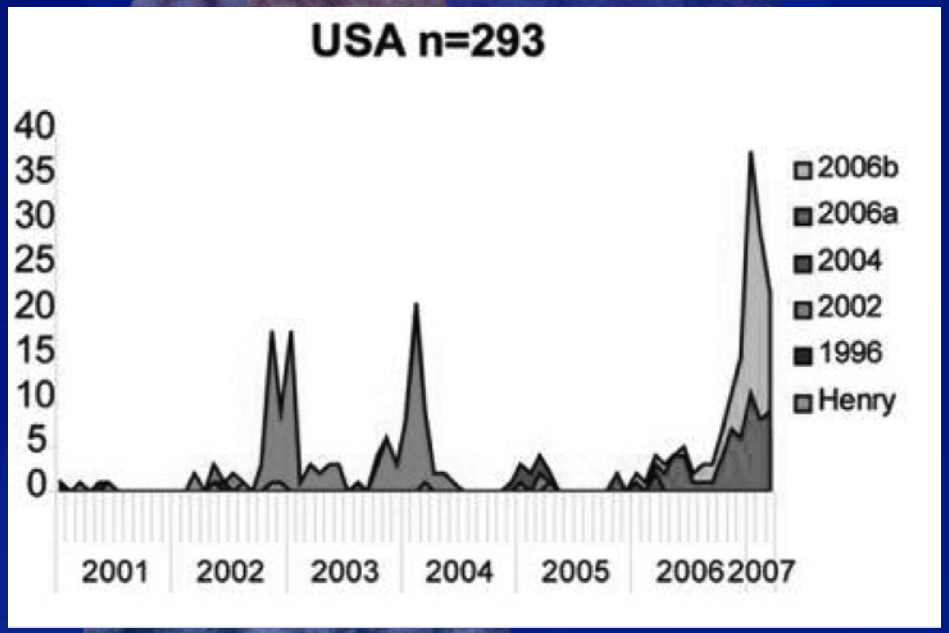


Figure 4: **Setting of norovirus outbreak in 2002 for six European regions**

Lopman et al. 2004. Lancet. 363(9410);682-8.

Dynamic Nature of Norovirus in the US

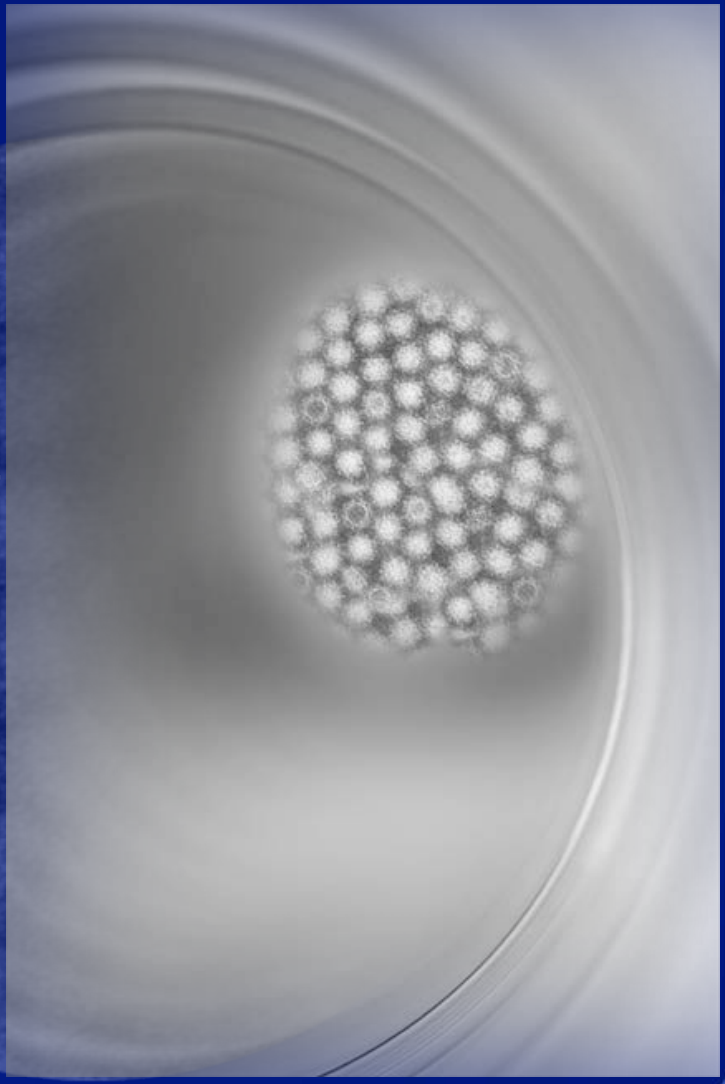


- Genogroup II type 4 (GII.4) noroviruses cause >75% of outbreaks worldwide
- New strains of GII.4 emerge every 3-5 years
- The periodic emergence of new strains is associated with heightened norovirus activity
- New strains in the 2002/03 and 2006/07 winters caused a surge in outbreaks

Siebenga ,et al,. 2009. JID802-12. 200(5).

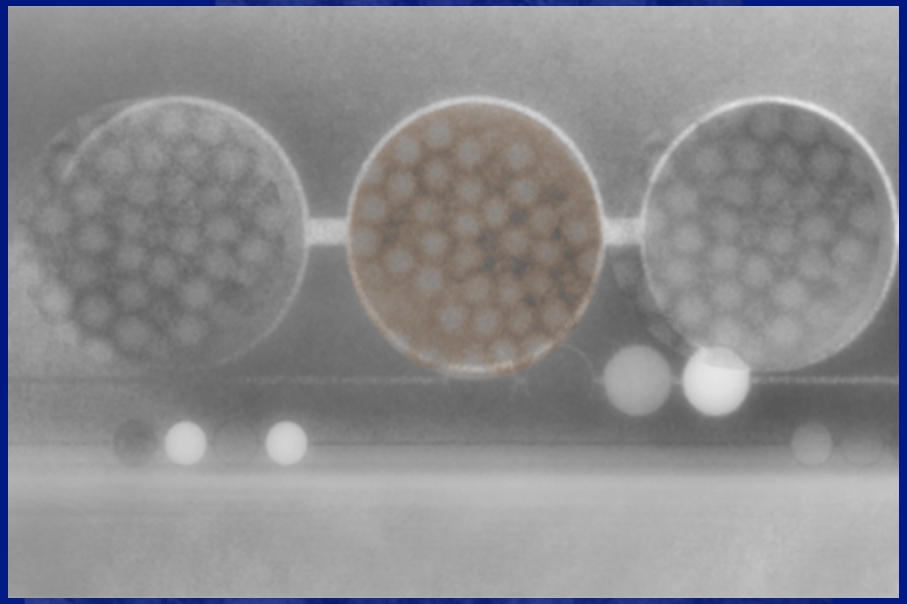
Clinical Disease

- Infectious dose: 18-1000 viral particles
- Incubation period: 12-48 hours
- Acute-onset vomiting and/or diarrhea
  - Watery, non-bloody stools
  - Abdominal cramps, nausea, low-grade fever
  - 30% infections asymptomatic
- Most recover after 12-72 hours
  - Up to 10% seek medical attention; some require hospitalization and fluid therapy
  - More severe illness and death possible in elderly and those with other illnesses



Viral Shedding

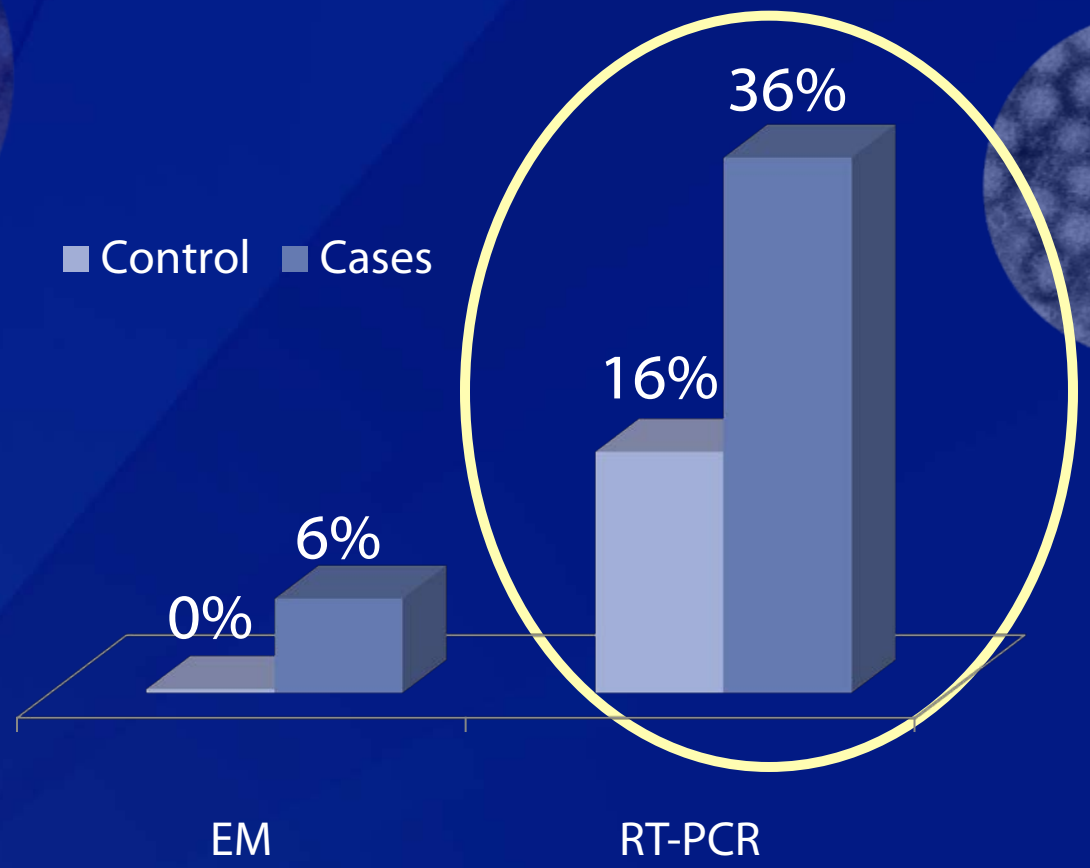
- Primarily in stool, but can also be present in vomitus
- Shedding peaks 4 days after exposure
- In some individuals, shedding may occur for at least 2-3 weeks
- ~10^{12} viral copies/gram feces
- May occur after resolution of symptoms
- Infectivity of shed virus in environment unknown
- Shedding in asymptomatic individuals is common but their role in transmission in not known



Immunity to Norovirus

- Short-term immunity after infection
- There is little cross protective immunity (against different genotypes)
- No long-term immunity
  - Protection believed to last less than one year, and in some studies, protection may only last a few months
- Genetic susceptibility
  - A portion of the population may be genetically resistant to norovirus infection
  - Currently no commerically available test to identify those who might carry genes conferring resistance to norovirus infection

Norovirus Prevalence in the Community



Using sensitive PCR diagnostics, norovi rus is frequently detected in stools of both infected individuals (cases) and healthy asymptomatic individuals (controls)

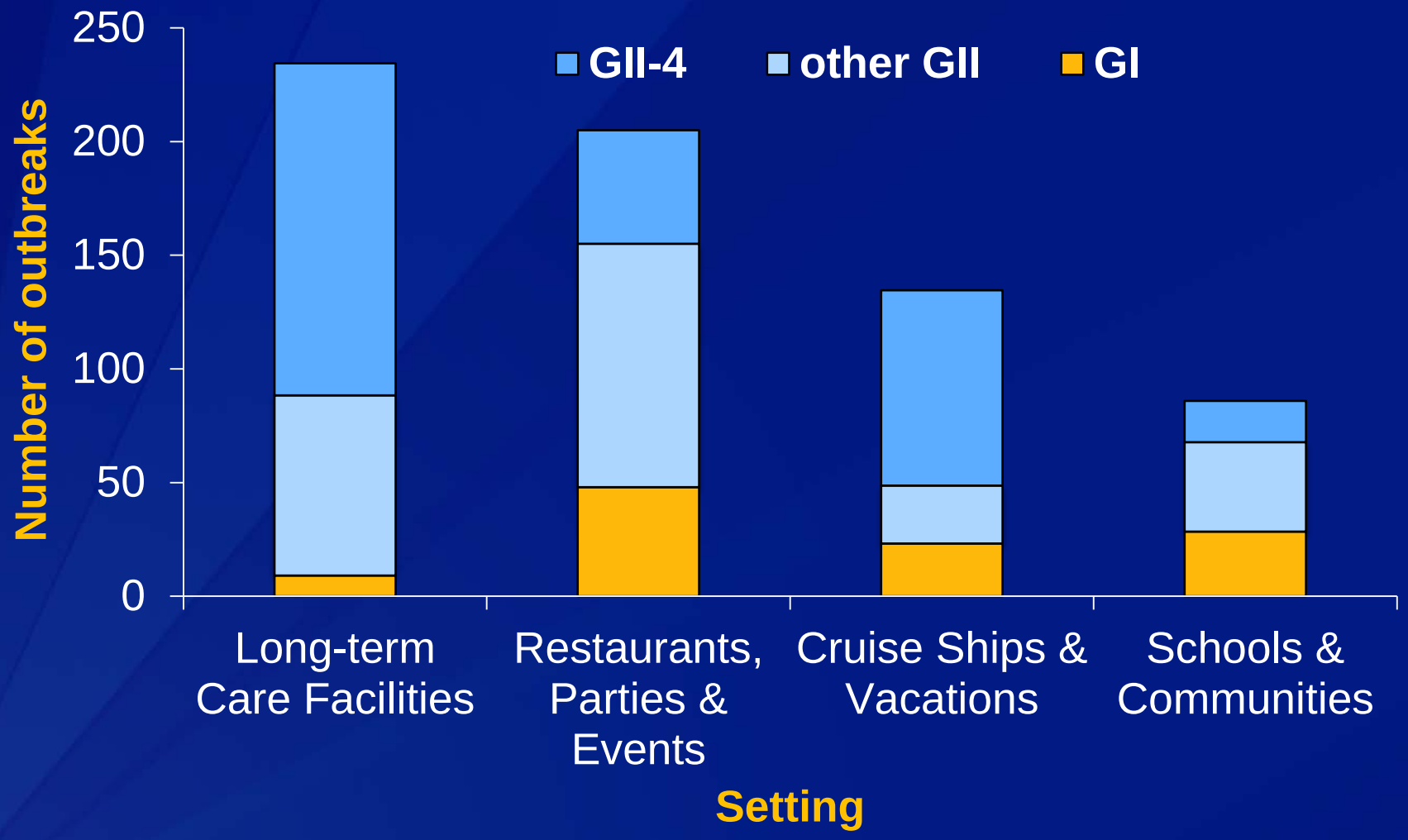
Amar et al, 2007. Eur J Clin Microbiol Infect Dis. 26(5); 311-23.

Transmission of Disease

- Person to person
  - Direct fecal-oral
  - Ingestion of aerosolized vomitus
  - Indirect via fomites or contaminated environment
- Food
  - Contamination by infected food handlers
  - Point of service or source (e.g., raspberries, oysters)
- Recreational and Drinking Water
  - Well contamination from septic tank
  - Chlorination system breakdown

★ In healthcare, the most likely and common modes of transmission are through direct contact with infected persons or contaminated equipment

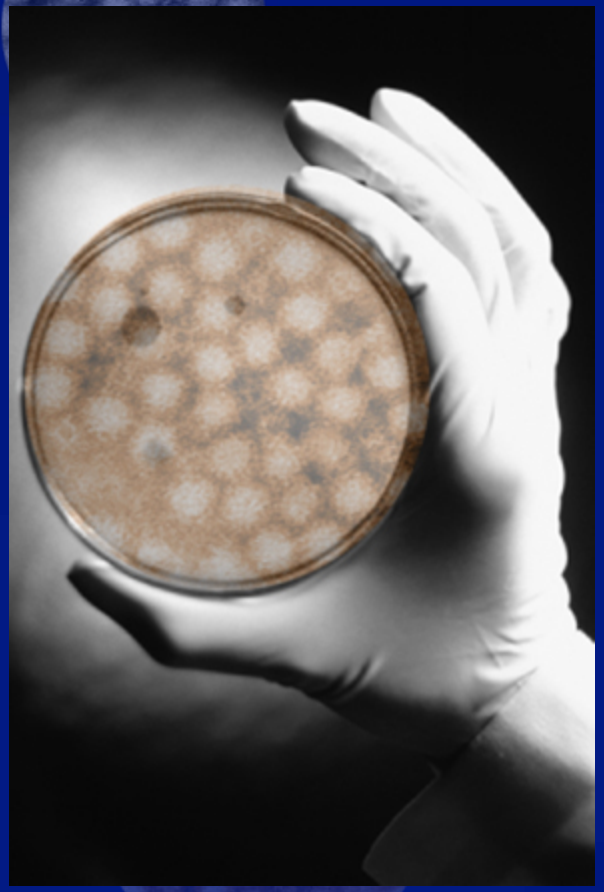
Setting of Norovirus Outbreaks
Reported to CDC, United States 1994-2006



Zheng et al. 2010. J Clin Microbiol. 48(1); 168-77.

Laboratory Confirmation of Norovirus

- Where available, reverse transcription polymerase chain reaction (RT-PCR) confirmation is the preferred diagnostic for norovirus
- State public health laboratories may be able to provide RT-PCR diagnostics to confirm norovirus
- Typically, state laboratories require a minimum number of stool samples from a subset of symptomatic patients before initiating confirmatory testing



Submitting Clinical Samples for Norovirus Testing

- Consult with receiving clinical, local or state health labs prior to submitting samples for norovirus identification
  - Depending on laboratory policies, may need multiple suspect cases before specimen testing can be performed
- Stool specimens should be collected from individuals during acute phase of illness
  - Virus may be able to be detected in specimens taken later in the course of illness, but sensitivity is reduced
- Submit stool specimens as early as possible during a potential outbreak or cluster
- While not ideal, vomitus may be submitted for testing to some labs
- Both staff and patient cases can be tested

What should clinical staff do when they suspect norovirus?

- Key Infection Control Activities
  - Rapid identification and isolation of suspected cases of norovirus gastroenteritis
  - Communicating the presence of suspected cases to Infection Preventionists
  - Promoting increased adherence to hand hygiene, particularly the use of soap and water after contact with symptomatic patients
  - Enhanced environmental cleaning and disinfection

- Promptly initiate investigations
  - Collection of clinical and epidemiological information
  - Obtain clinical samples

Infection Control:
Patient Isolation or Cohorting

- In healthcare settings where risk of transmission is high, use of isolation precautions is often the most effective means of interrupting transmission

- CONTACT PRECAUTIONS – single occupancy room with a dedicated bathroom, strict adherence to hand hygiene, wear gloves and gown upon room entry
  - Use Contact Precautions for a minimum of 48 hours after the resolution of symptoms
  - Symptomatic patients may be cohorted together
  - Exclude ill staff members and food handlers in healthcare facilities for a minimum of 48 hours following resolution of their symptoms
  - Exclude non-essential personnel and visitors

Infection Control: Hand Hygiene

- Wash with soap and water after contact with symptomatic patients
  - For all other indications, refer to the 2002 Guideline for Hand Hygiene*
- Alcohol-based hand sanitizers
  - Currently available products appear to be relatively ineffective against norovirus
  - Consider using FDA-compliant alcohol-based hand sanitizers for other indications (e.g., before contact with NV patient)*

*CDC HICPAC Guideline for Hand Hygiene in Health-Care Settings: http://www.cdc.gov/mmwr/PDF/rr/rr5116.pdf

Liu et al,. 2010. Appl Environ Microbiol, 76(2); 394-399

Infection Control: Environmental Cleaning and Disinfection

- The use of chemical cleaning and disinfecting agents are key in interrupting norovirus spread from contaminated environmental surfaces.

- Increase the frequency of cleaning and disinfection of patient care areas and frequently touched surfaces
  e.g., increase ward/unit level cleaning to twice daily, with frequently touched surfaces cleaned and disinfected three times daily

- Use commercial cleaning and disinfection products registered with the U.S. Environmental Protection Agency (e.g., sodium hypochlorite (bleach) solution, hydrogen peroxide products, etc.)
  http://www.epa.gov/pesticides/antimicrobials/list_g_norovirus.pdf

- It is critical to follow manufacturer instructions for methods of application, amount, dilution, and contact time

Infection Control: Other Considerations

- To reduce transmission, and depending on the magnitude of the outbreak, cohort staff to care for patients who are
  - asymptomatic unexposed
  - asymptomatic, potentially exposed
  - symptomatic
- Remove communal or shared food items for staff or patients for the duration of the outbreak
- Group activities for patients may need to be suspended; minimize patient movements within a patient care area to help control transmission

Surveillance for Norovirus Cases

- Units can use a "line list" to track symptomatic staff and patients
- During an outbreak, collect key information to assist with controlling the outbreak and to inform local/state health departments on outbreak details
- Suggested line list elements
  - Case (staff/patient) identifier
  - Case location
  - Symptoms
  - Outcome / Date of Resolution
  - Diagnostics submitted

Reporting Outbreaks

Internal Communication

- Report gastroenteritis outbreaks (e.g., 2 or more suspected or confirmed cases among staff or patients) to infection control units
- Outbreaks should also be reported to clinical management
- Important to include communications, laboratory, environmental services, admitting, occupational health departments

Reporting Outbreaks

External Reporting

- Report norovirus outbreaks to your local, county, or state health department
- In most states, all outbreaks of public health significance are reportable to the state health department
- Health departments enter norovirus outbreak data (among other pathogens) into National Outbreak Reporting System (NORS) → Centers for Disease Control and Prevention (CDC)

Summary: Management of Norovirus Outbreaks

- Create awareness of concurrent norovirus outbreaks in the community/ other local healthcare facilities
- Detect and confirm suspected norovirus cases rapidly
- During outbreaks, implement
  - Contact Precautions,
  - enhanced hand hygiene,
  - environmental infection control measures,
  - exclusion of ill staff from work for a minimum of 48 hrs after symptom resolution
  - surveillance for new and resolving cases,
- Develop a communication plan during outbreaks to include key departments and services
- Consult with and report outbreak to local/state health departments

Additional Resources

- **Norovirus in healthcare settings**
  http://www.cdc.gov/HAI/organisms/norovirus.html

- **CDC HICPAC Guideline for the Prevention and Control of Norovirus Gastroenteritis Outbreaks in Healthcare Settings**
  http://www.cdc.gov/hicpac/pdf/norovirus/Norovirus-Guideline-2011.pdf

- **Updated Norovirus Outbreak Management and Disease Prevention Guidelines**
  http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6003a1.htm?s_cid=rr6003a1_e

- **General information on norovirus**
  http://www.cdc.gov/ncidod/dvrd/revb/gastro/norovirus.htm

For more information please contact Centers for Disease Control and Prevention

1600 Clifton Road NE, Atlanta, GA 30333
Telephone: 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348
E-mail: cdcinfo@cdc.gov Web: http://www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.